



The Biggest Menace Is the Fact that Mao Does Not The Nuclear Power of

Ralph Lapp has rare credentials to write this article. In the wartime pioneering days of nuclear physics he served as assistant director of the Metallurgical Laboratory, code name for the first A-bomb project at the University of Chicago. Later Dr. Lapp spent three years with the War Department as an atomic energy adviser and as executive director of the Atomic Energy Research and Development Board in the Department of Defense. As a nuclear physicist, he has specialized in the effects of nuclear weapons and is a recognized expert on radioactive fallout. His 11 published books include one on the biological effects of radiation, a textbook on nuclear physics and Kill and Overkill.

**by DR. RALPH
E. LAPP**

Communist China has exploded its second atomic bomb, just eight months after the announcement of its first atomic test. It is an unfortunate fact that China's nuclear potential still seems to worry U.S. officials very little. Many of them have ill-disguised contempt for it.

This is an understandable reaction, considering the enormous stockpile of nuclear weapons in U.S. strategic vaults. But it is a risky state of mind which would dismiss China, out of hand, as a primitive two-bomb country.

China can, in a very few years, become the most dangerous nuclear power of all—not because the Chinese leaders can match the U.S. might, but because they do not

seem to understand nuclear war and therefore may not be rationally deterred from starting one. General Lo Jui-ching, chief of staff of the Chinese army, recently stated this attitude in *Red Flag*, the ideological mouthpiece of the Chinese Communist party. General Lo wrote that the psychological preparation of the Chinese masses for conventional and even nuclear war "must be given first priority" and added that while a nuclear war will "cause sacrifices and destruction, it will also educate the people."

This view is typical. Mao Tse-tung and the men under him show signs of being under the unbelievably dangerous delusion that their country might survive a nuclear war. Thus, for them, the unthinkable conflict is thinkable.

Mao's known conclusions about

nuclear war are simply wild. Nikita Khrushchev reported some of them in 1963, when Russia and Red China publicly quarreled over a nuclear test ban. According to Khrushchev, this was what Mao had to say: "Can one guess how great will be the toll of human casualties in a future war? Possibly it would be a third of the 2.7 billion inhabitants of the entire world. . . ."

"Personally, I think that in the entire world half of humanity, and perhaps even more than half, will perish."

"If half of humanity were destroyed, the other half would still remain, but imperialism would be destroyed entirely and there would be only socialism in all the world, and within half a century or a whole century the population would again increase by more than half."

Mao's mortality projection is



Understand It

China

Mao Tse-tung (left, foreground) and top aides appear at massive rally in Peking following China's initial atomic explosion last fall (picture at right). That was a Hiroshima-type 20-kiloton bomb; second bomb on May 13 was probably more powerful.

not incredible. But there is no rational way to account for his weird view that "socialism," which he obviously equates with the Chinese nation, would emerge triumphant from such a war.

There are some "facts" which appear to support his reasoning. But Mao (knowingly or unknowingly) uses "facts" as the proverbial drunk uses a lamp post: more for support than illumination. For example:

FACT No. 1. China is the most populous nation on earth. It numbers 720 million people, give or take 30 million (even Mao admits the total is uncertain). By the Orwellian year 1984 experts estimate there will be a billion Chinese in China. Mao told a visiting Yugoslav in 1957, "We aren't afraid of atomic bombs. What if they killed even 300 million [Chinese]? We would still have plenty more—

China would be the last country to die."

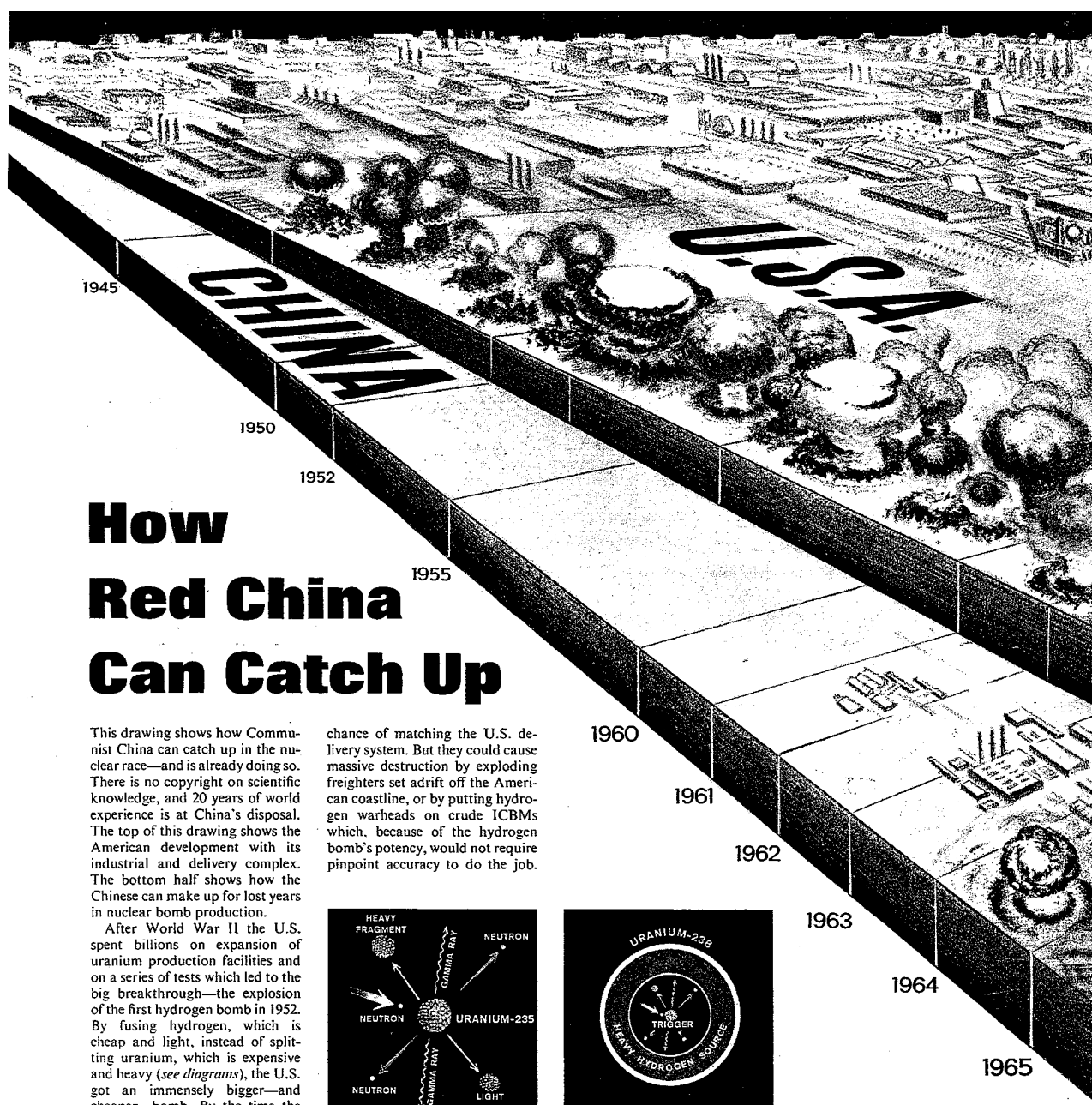
FACT No. 2. Only one seventh of China's teeming population is crowded into cities. Perhaps Mao believes that China, therefore, is protected from obliteration by the dispersion of its people.

FACT No. 3. Red China is on a very low rung of the economic ladder. Mao appears to believe that, in case of a nuclear war, this condition is a positive advantage: China has less to lose.

A man misled by such "facts" is a dangerous man in a position of power. True, the nuclear might of the U.S. is great—so great that it would appear we have little to worry about in a nuclear confrontation with Mao, now or ever. The U.S. stockpile has reached a point where nuclear production to meet

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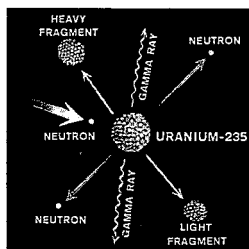
How Red China Can Catch Up

This drawing shows how Communist China can catch up in the nuclear race—and is already doing so. There is no copyright on scientific knowledge, and 20 years of world experience is at China's disposal. The top of this drawing shows the American development with its industrial and delivery complex. The bottom half shows how the Chinese can make up for lost years in nuclear bomb production.

After World War II the U.S. spent billions on expansion of uranium production facilities and on a series of tests which led to the big breakthrough—the explosion of the first hydrogen bomb in 1952. By fusing hydrogen, which is cheap and light, instead of splitting uranium, which is expensive and heavy (see diagrams), the U.S. got an immensely bigger—and cheaper—bomb. By the time the nuclear test ban treaty was signed in 1963, the U.S. had a highly sophisticated H-bomb arsenal.

By leapfrogging old scientific barriers, the Chinese can, if they wish, produce a 100-megaton hydrogen bomb by the 1970s. The U.S. has built a 25-megaton bomb and could of course make a 100-megaton—or even bigger—bomb more easily than the Chinese. The Chinese do not have the slightest

chance of matching the U.S. delivery system. But they could cause massive destruction by exploding freighters set adrift off the American coastline, or by putting hydrogen warheads on crude ICBMs which, because of the hydrogen bomb's potency, would not require pinpoint accuracy to do the job.



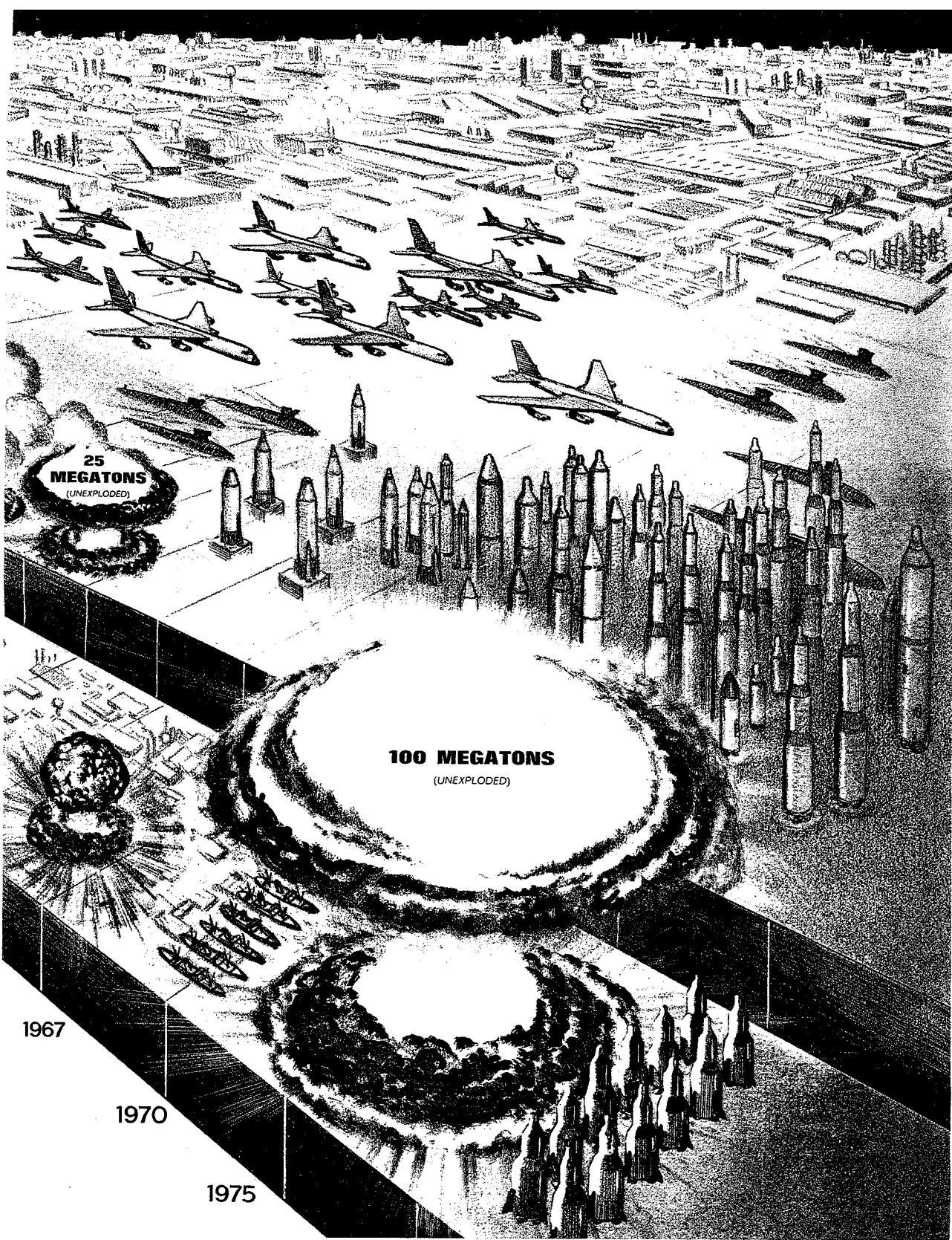
FISSION

An atomic bomb depends upon the fission—splitting up—of a heavy atom like uranium, a rare but particularly suitable form of which is called U-235. When a neutron bombards its nucleus, the uranium atom splits into fragments and liberates deadly gamma radiation and two neutrons. They then smash other nuclei in the uranium mass and create a chain reaction which unleashes immense energy. This is the hard elementary road the U.S. traveled in the early 1940s.



FUSION

A hydrogen bomb depends on the fusion of two atoms of a special type of hydrogen which is fairly easy to produce. An atomic explosion inside the bomb creates heat comparable to the sun's interior and fuses the hydrogen atoms, releasing vast energy—less energy is needed to keep the atoms together than to keep them apart. Fusion, in turn, sets off a fission reaction in a layer of uranium called U-238. This is the short cut the Chinese will almost surely take.



100 MEGATONS
(UNEXPLODED)

25 MEGATONS
(UNEXPLODED)

1967

1970

1975

What would happen if Mao miscalculated now?

MAO'S BOMB CONTINUED

military demand has actually been cut back; our arsenal is now over-stuffed. The Strategic Air Command has hundreds of B-52 bombers, each of which can carry two 25-megaton bombs in its belly—the equivalent of 50 million tons of TNT. These are "dirty" bombs, which can spread lethal radioactivity over thousands of square miles. In addition, the U.S. arsenal includes more than 1,000 nuclear-tipped ballistic missiles for the future when the heavy bomber, it is believed, will be obsolete. The total will be 1,710 when the last Minuteman and Polaris missiles have been manufactured. There will also be 54 Titan II's if that weapon is not phased out (its future is now uncertain).

Surely, our argument goes, even when China grows far more prestigious in nuclear power, American superiority will prevail. After all, Khrushchev backed down before President Kennedy's Cuban ultimatum. Won't Mao, or his successor, be equally intimidated?

The answer is that China is not Russia, and Mao is not Khrushchev. Ultimately nuclear deterrence depends on a state of mind, and what we know or can deduce about Mao's state of mind is quite alarming. This has to be taken into account if our nuclear strength is to be maintained, in John F. Kennedy's cogent phrase, as "sufficient beyond doubt."

In the nerve-racking game of nuclear deterrence, the stakes are, quite literally, national survival. In the Cuban confrontation Khrushchev backed down and removed his missiles because he did not think the rewards of his move were worth the risks. Khrushchev clearly grasped the essential nature of nuclear weapons. This was confirmed to me by Dr. Leo Szilard, the late scientist, who had an hour-and-a-half interview with Khrushchev at the time of his visit to the U.S. in 1960. Afterward Szilard told me that the Soviet leader had shown considerable knowledge about nuclear weapons. He had peppered his conversation with sentences beginning, "My scientists tell me that . . ." and had spoken specifically and intelligently about radioactive fallout.

Late last year Mao gave an interview to his friend Edgar Snow, the U.S. correspondent and author. He made it clear that he had been doing some homework on fallout, too, but that he still was

drawing the wrong conclusions. For example, Mao told Snow that he had been reading U.S. reports on follow-up studies conducted at Bikini Atoll in the Pacific, where our Atomic Energy Commission tested many nuclear weapons in the 1940s and 1950s. Mao noted that U.S. scientists have since observed flourishing wildlife and vegetation on the islands. He inferred that fallout wasn't so bad—animals and, presumably, the people would live on.

Mao has this all mixed up, but part of the blame can be laid at the doorstep of the AEC. In its early zeal to continue testing nuclear weapons the AEC originally pooched fallout, using a wide variety of adjectives to describe its relative insignificance.

This was a myopic U.S. policy. No nuclear power should undercut its own deterrent policy by playing down the potency of its weapons. In fact AEC officials, in the 1950s, should have taken the line that radioactive fallout was even more devastating in its biological effects than some "alarmists" were then saying. This would have been a true appraisal, and it was in the national interest to make it public.

Up to now almost all the U.S. thinking about nuclear deterrence

has focused on the Soviet Union. This is natural. So that the men in the Kremlin shall have no doubt about the consequences of nuclear war, Secretary of Defense Robert McNamara has wisely publicized the extent of U.S. power. This February he told the House Armed Services Committee that a U.S. missile strike, "if it were directed against the [Soviet] aggressor's urban areas, could cause more than 100 million fatalities and destroy about 80% of his industrial capacity." It should be noted that the Pentagon makes such calculations on the basis of death within 48 hours. It does not add in the millions of deaths which would inevitably follow in the aftermath.

Secretary McNamara has not made public any estimates on what a nuclear strike at the Red Chinese mainland would accomplish. The penalties inflicted upon Red China would depend critically upon the time of the assumed U.S. attack. If there should be war in the 1960s, the attack would be made principally by the Strategic Air Command's heavy bombers and our carrier-based jets. In the 1970s the burden would shift to missiles.

Suppose Mao makes a miscalcu-

lation and brings on nuclear war in the next three or four years. This is what would happen in a manned-bomber attack on China.

We can make the conservative assumption that 400 bombs of the 25-megaton class would then be dropped on mainland targets in China. This adds up to 10,000 megatons, equivalent to 10 billion tons of TNT, or 14 tons for every man, woman and child in Red China.

A single 25-megaton bomb is a fearful instrument of destruction. It is 1,250 times more powerful than the bomb which was dropped on Hiroshima. The blast wave from one such bomb would destroy almost all Chinese housing over an area of 250 square miles. Within this area fatalities would be 80%. Then the huge sphere of fire created by the explosion would flash out over the target area, and the searing heat would extend far beyond the limits of any existing Chinese metropolitan area.

Data recently compiled for Field Enterprises Educational Corp. by the Population Reference Bureau show that there are in Red China 19 "megacities" (i.e., metropolitan areas of more than one million population). But less than 10% of China's population is located in

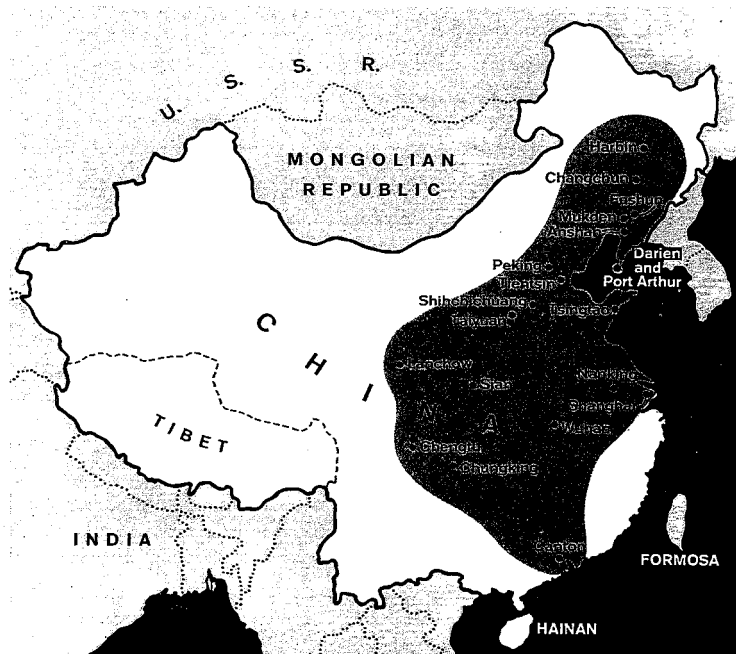
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China's 'Megacities' Vulnerable to Attack

China is vulnerable to nuclear attack because, as Lapp writes, half a billion people live on a fifth of the land area. Each of the 19 cities

shown here has a population in excess of a million. A manned-bomber strike in the 1960s would kill nearly 500 million people, either

at once or in a few weeks, as prevailing westerlies spread fallout on east China—a factor Mao still does not appear to comprehend.



Fallout Makes War a Whole New Ball Game

MAO'S BOMB CONTINUED

cities of more than 250,000 people (in the U.S. the corresponding statistic is 53%). Thus the primary heat blast of nuclear bombs delivered by our B-52s would strike at a relatively small percentage of the Chinese population.

We have to consider more than that, however, before jumping to the conclusion that Mao may be right—that is, China might survive a B-52 attack by sacrificing its urban population.

When a monstrous megaton explosion takes place at the earth's surface or close to it, the fireball sucks in immense quantities of pulverized debris. Atomic fragments of uranium glue themselves to this debris, which is hoisted upward by the draft of the bomb cloud. These radioactive particles constitute the deadly spores of the mushroom cloud. They fall back to earth within hours, sometimes as visible talc-like dust, more often as a faint drizzle that eludes the eye. This "dirty" fallout adds a new dimension to warfare, and this Mao seems not to understand.

The fallout from a single 25-megaton bomb can coat 15,000 square miles (the combined area of Connecticut, Rhode Island and Vermont) with a residue of lethal radioactivity. In some areas the contamination would be so intense that one hour's exposure would mean death. Multiple exposures would bring death more quickly, though no less painfully. To survive this rain of death, Chinese peasants would have to go underground. In some areas they would have to live like moles for months, and even so the world into which survivors emerged would be far from safe.

How much of China would be drenched by fallout? A brief examination of Chinese geography and demography is useful here. China's borders enclose 3,657,765 square miles; the country is 20% larger than the U.S.—about the size of Canada. But much of China is high and dry and supports only hardy nomads and hunters. The bulk of the population is packed into 13 of China's 22 provinces. Half a billion people live on one-fifth of China's land area.

This is the Good Earth of China which has long defied permanent conquest. But it is not a large area when we consider the fallout patterns that would be created by 400 superbombs. Analysis of the over-

lapping zones of contamination from a 10,000-megaton attack shows that the prevailing westerly winds would spread death on a colossal scale. The windborne fallout from our assumed attack has the potential of killing 350 million Chinese and severely injuring 100 million more. Including blast-heat mortality, we can conclude that almost half a billion people would die, immediately or in a few weeks, because of such a bomber strike.

China has endured all manner of catastrophes—floods, pestilence, famine and the invader's sword. But there is no precedent for such holocaust. No nation could survive such slaughter. Even if, by some miracle, it managed to summon the collective will to survive, the disruption of community services like public health would make it impossible to service the elementary needs of society. Disease would make an unimaginable hell of what life remained. Hence the logic expressed by the Chinese Communist party on Sept. 6, 1963 is simply fantastic: "We say that if imperialism should unleash a nuclear war and the worst came to worst, half of the world's population would be killed. We are optimistic about the future of mankind."

In the history of optimistic expression, this statement must occupy a unique position.

War is a dirty business and always has been. But nuclear war has a special dirtiness, the full nature of which is even yet little perceived. It can be summed up in one word: *radio-strontium*, or Strontium 90. This is an atomic-age atom produced when the uranium atom is split. It has a half life of 28 years, meaning that if war broke out this year, half of the Strontium 90 produced by nuclear bombs would still be around in 1993. A quarter of the original amount would persist in the soil until 2021. Because of its chemical similarity to calcium, this element would be absorbed into foodstuffs and would therefore enter human bodies and "lay down" to produce bone tumors and cancer. Strontium 90's potency is such that it can inflict "agricultural defeat" upon any nation in the world—including China. The conclusion is clear: *China would be destroyed in a nuclear attack.*

If Red Chinese leaders truly understand these facts, they would almost certainly be deterred from nuclear adventure in the present

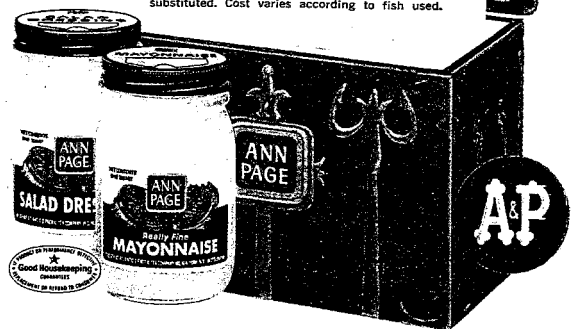
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A Recipe to Treasure from Ann Page

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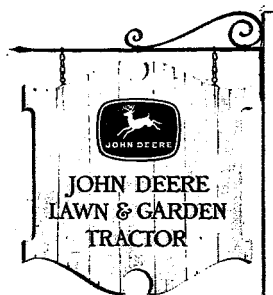
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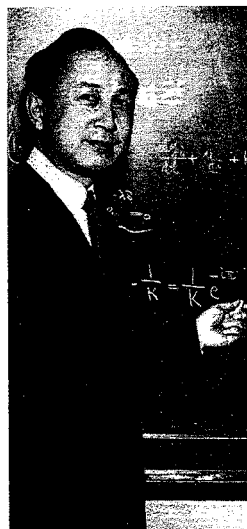
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Help, Direct and Indirect

The Chinese get direct help on rocketry from Hsue-shen Tsien, who received a master's degree from M.I.T. and a Ph.D. from Caltech. He was deported in 1955 although he had denied membership in the Communist party before entering U.S. He has since been in China doing rocket research. The Chinese probably got indirect help in the 1950s—when

Russia and China shared information—from the traitors Bruno Pontecorvo and Klaus Fuchs, who had been top nuclear scientists in England. Pontecorvo fled to Russia in 1950 and became a research director at the Dubna Institute. Fuchs spent nine years in prison for having given secrets to the U.S.S.R. Freed in 1959, he is now in East Germany.

MAO'S BOMB

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decade. We must make sure that they acquire this understanding.

But we must also consider the situation in the 1970s, when the nuclear might of the U.S. will be packaged in missile warheads. Suppose we assume that half of our Minuteman and Polaris missile armada is to be directed toward Red Chinese targets. Allowing for aborted firings, dud bombs and inaccuracy, this would mean conservatively 700 on-target impacts, each missile packing about one megaton or the punch of one million tons of TNT. The total missile strike would add up to about 700 megatons—or about 1/14th the destructive force delivered in our hypothetical B-52 bombing. The use of half our Titan II missiles—if they still exist—would not add significantly to the megatonnage total.

In cold-blooded statistics, just 310 of these warheads targeted at China's cities would kill about 54 million people, but it would take strikes at the next 244 city-town

targets to kill another 12 million. Presumably the remaining 146 of our 700 warheads would be directed at "military" targets.

This missile strike would kill 66 million Chinese and injure perhaps 40 million more. The missiles would not engender radioactive fallout on the scale of our B-52 attack for two reasons.

First, the total releasable "dirt" in the bombs is proportional to the explosive yield or megatonnage, so the ballistic missile attack would carry only 1/14th the radioactive lethality of the bomber strike.

Second, the missiles would have to be exploded at "optimum" height to spread their blast heat over the target areas. Little ballast from the earth's surface would enter the fireball, and consequently there would be little or no fallout. China would be badly maimed, but its soil would be intact and it could survive.

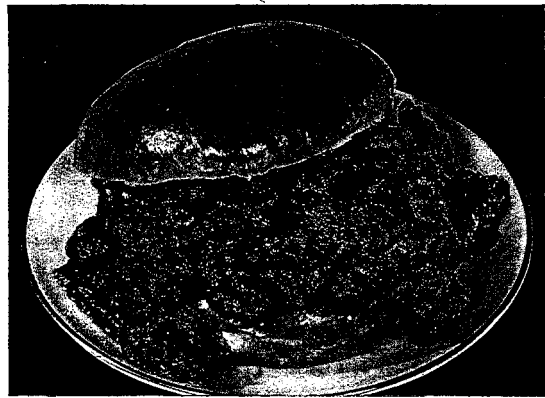
Would this prospect deter Red China? No Pentagon computer, however nimble, can answer that question. *But it does not appear that the weight of nuclear explo-*

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Overkill Must Leave No Room for Doubt

MAO'S BOMB CONTINUED

sives deliverable by our presently programmed missile force will be "sufficient beyond doubt."

A preventive-war advocate or a big-bomber enthusiast might, therefore, jump to the conclusion that the U.S. should strike now, while it has an overwhelming overkill capacity—or that we should fabricate new strategic bombers capable of hauling huge megaton-nages. Neither of these two courses is acceptable. Preventive nuclear war is a contradiction in terms, to say the least. And new bombers, no matter how big, cannot compete with missiles either in getting off the ground or getting through to their targets.

Nonetheless, a capacity for a certain degree of overkill is essential to underline the "beyond doubt" condition basic to deterrence, especially when a mind like Mao's shortens the odds.

While Secretary of Defense McNamara has stated that "... a 35-megaton warhead for our Titan II [missile program] could be developed and stockpiled..." he has so far favored the smaller Minuteman and Polaris over "high-yield" monsters. His focus has been on pinpoint precision against military targets, achievable with present hardware.

But one cardinal fact remains. In the 1970s nuclear firepower measured in missile-megatons will be a small fraction of the strike capability which the U.S. possesses today. Pentagon planners may yet conclude that another hundred or so Titan II-type missiles of even wobbly accuracy will be required as the ultimate "persuader." Since the whole apparatus of intimidation should leave no room for doubt in Mao's mind, it would seem ineluctable that our missile programming should include some overkill device like the Titan II.

Much to U.S.'s surprise, Red Chinese nuclear specialists chose to build an immense "gaseous diffusion" plant in which to produce uranium-235 for their A-bombs. High-flying U-2s have spotted what we believe to be this plant. It covers almost 10 acres in roof area near the city of Lanchow. It appears to be an Oak Ridge-type installation (with about 15% of Oak Ridge's original wartime capacity for producing uranium-235), supplied with hydroelectric

power from the mighty Yellow River. The Lanchow plant is credited with a one-bomb-per-month capacity in 1965, but this figure may be doubled as efficiency improves.

This is doing it the hard way. Americans charged with estimating China's atomic prowess believed the Chinese would elect to manufacture plutonium for bombs in atomic reactors, just as the British, the Russians and the French did. But China is now known to have a plutonium separation plant, and bombs of this type will be no surprise when they are tested.

Granted that China's first test explosion at Lop Nor last year was the equivalent of our Alamogordo, N. Mex. test of July 16, 1945, we cannot assume that the U.S. is 19 years ahead of China. China does not have to follow the same arduous trail blazed by the U.S. Because of what the U.S. did in the 1940s, the Chinese are more advanced now—they have had some benefits of our exploration. Many observers believe that some knowledge of early U.S. breakthroughs was transmitted to Peking (via Moscow) by the traitors Alan Nunn May, Bruno Pontecorvo and Klaus Fuchs. The Chinese, all during the 1950s, had at least some access to what was known by the Russians, who by then were finding out quite a lot on their own. There is also indigenous Chinese talent. Wang Kan-chang, believed to be China's No. 1 atomic scientist, studied in Germany in the 1930s and in 1959 was deputy director of Russia's Dubna Institute, an atomic research center. Chien San-chiang, who heads the Institute of Atomic Energy in Peking, was trained at the *Laboratoire Curie* in Paris.

Moreover, the technology of the atom has changed. Nuclear economics are not what they were in 1945. In the early 1950s, by switching from expensive heavy elements to cheap light elements, such as lithium and hydrogen, scientists transformed the bomb business. The cheap megaton bomb replaced the costly kiloton bomb.

This can be illustrated as follows. A powerful A-bomb costs, say \$250,000. Such a bomb produces a 100-kiloton bang—i.e., 100,000 tons of TNT. Suppose you have another \$250,000 to invest. You can shovel more precious U-235 or plutonium into the core of the atomic weapon and double or even triple its power. Or you can invest your money in hydrogen

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China Can Leapfrog Right to the Megaton

MAO'S BOMB CONTINUED

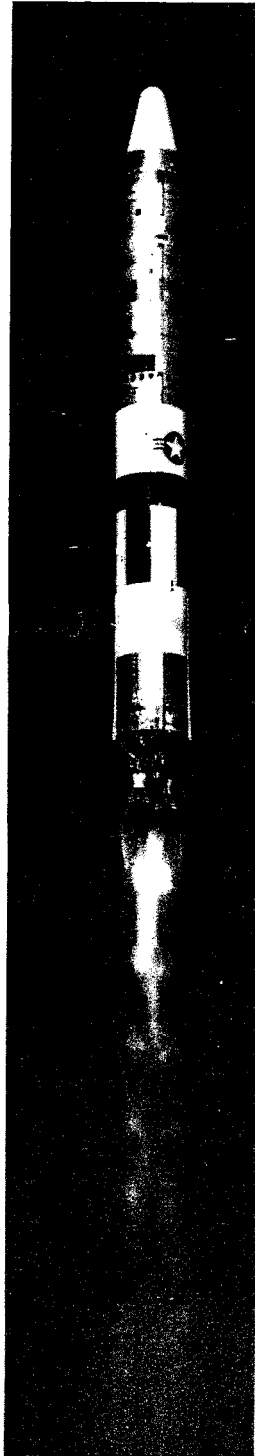
technology and increase your bang a hundredfold.

It seems probable that Red China will follow the latter course. The Chinese have to master the difficult technology of releasing energy from light elements, but they can leapfrog a full decade by putting priority on the megaton rather than on the kiloton. It will not be cheap or easy, but by the early 1970s China should possess impressive nuclear power. Optimists who assume that China will have no missile delivery system by then would do well to recall that the Chinese invented the rocket nearly a thousand years ago. Their *huo chien*, or fire arrow, was a hollow shaft of bamboo filled with slow-burning powder. It is, of course, a long leap from that to today's ICBM technology, but the Chinese do have the knowledge and services of Dr. Hsue-shen Tsien, who worked on rocket research at the California Institute of Technology before he was deported in 1955. Dr. Martin Summerfield, professor of Aerospace Propulsion at Princeton University, warned recently:

"From my contacts with many Chinese students, professors and engineers over the past 30 years, I would say it is a serious underestimate to believe that they cannot plan and execute an efficient research, development and production program for practical missiles, and it is a serious underestimate to believe that they are not already close to their objective."

When Red China does possess the capacity to challenge the U.S., the lives of 80 million Americans will hang in the balance. One fervently hopes that such an apocalyptic confrontation can be avoided. Meanwhile, no nuclear power dares relax its grip on the nuclear sword. In a sense it is an idiot's apparatus—if it has to be used, then it has failed in its purpose. But until some alternative international security arrangement is devised, we must make certain our nuclear arsenal is adequate to keep the peace that Sir Winston Churchill defined as peace maintained through "mutual terror."

A Titan II rises in test firing. Such a missile, or something beyond it, is essential, Dr. Lapp affirms, to establish the "beyond doubt" deterrent credibility.



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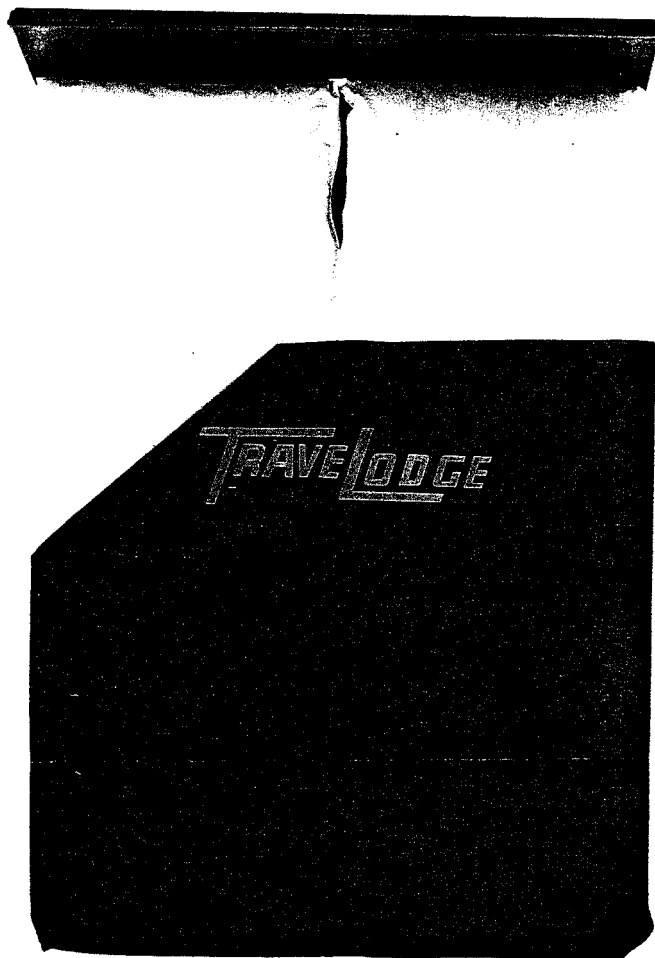


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